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EXAMINER
D AGOSTA, STEPHEN M

ART UNIT	PAPER NUMBER
2684	

DATE MAILED: 09/12/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/578,004	DABAK ET AL.	
	Examiner	Art Unit	
	Stephen M. D'Agosta	2684	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☒ The proposed drawing correction filed on *26 September 2000* is: a)☐ approved b)☒ disapproved by the Examine

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Drawings

The drawings (figure 1) are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "14" has been used to designate both the channel encoder (far left block) and the receiver (entire right-hand block). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 8-23, 27, 30 and 34 rejected under 35 U.S.C. 103(a) as being unpatentable over Harrison U.S. Patent 6,154,485 and further in view of Naguib et al. U.S. Patent 6,178,196 and Lundby et al. U.S. Patent 6,356,528 (hereafter referred to as Harrison, Naguib and Lundby).

As per **claims 1 and 34**, Harrison teaches a wireless communication system (C1, L8-10) comprising;

Transmitter circuitry (C2, L58-60) for receiving a plurality of symbols (spread symbols – C1, L52-54);

A plurality of antennas coupled to the transmitter circuitry and for transmitting from the transmitter circuitry to a receiver, wherein the signals are responsive to the plurality of symbols (C1, L54-57); and

Wherein the encoder circuitry is for applying open loop diversity and closed loop diversity to the plurality of symbols to form the symbols (C1, L58-67).

But is silent on an encoder (ie. block, convolutional, turbo, combo, etc.),

While encoder/decoders are known in the art, **Naguib** discloses block codes (figure 1, #13 and #33), transitter diversity (C1, L10-11 and C1, L53-67) and multiple transmit/receive antennas (C3, L10-25) in a wireless system.

The examiner also points out that **Lundby** discloses the use of multiple types of diversity, including delay transmit, OTD, TSTD, TDTD and MCTD (C3, L28-36).

It would have been obvious to one skilled in the art at the time of the invention to modify Harrison, such that encoder/decoders are used, to improve raw bit error rate.

As per **claim 8**, Harrison teaches claim 1 and orthogonal and adaptive antenna transmission (diversity) **but is silent on** wherein open loop diversity comprises space time block coded transmit antenna diversity.

The examiner also points out that Lundby teaches the use of multiple types of diversity, including delay transmit, OTD, TSTD, TDTD and MCTD (C3, L28-36). Hence one skilled in the art would use space time block coded transmit antenna diversity as a design choice.

It would have been obvious to one skilled in the art at the time of the invention to modify Harrison, such that space time block coded transmit antenna diversity is used, to provide designs whereby the type of diversity is flexible as a design choice.

As per **claim 9**, Harrison teaches claim 1 and open loop diversity that comprises orthogonal transmit (abstract – last sentence).

As per **claim 11**, Harrison teaches/discloses claim 1 and orthogonal and adaptive antenna transmission (C1, L58-67).

As per **claim 10**, Harrison teaches claim 1 and orthogonal and adaptive antenna transmission (diversity) **but is silent on** wherein open loop diversity comprises switched time diversity.

The examiner also points out that Lundby teaches the use of multiple types of diversity, including delay transmit, OTD, TSTD, TDTD and MCTD (C3, L28-36). Hence one skilled in the art would use space time block coded transmit antenna diversity as a design choice.

It would have been obvious to one skilled in the art at the time of the invention to modify Harrison, such that switched time diversity antenna diversity is used, to provide designs whereby the type of diversity is flexible as a design choice.

As per **claim 12**, Harrison teaches claim 11 and orthogonal and adaptive antenna transmission (diversity) **but is silent on** wherein open loop diversity comprises space time block coded transmit antenna diversity.

The examiner also points out that Lundby teaches the use of multiple types of diversity, including delay transmit, OTD, TSTD, TDTD and MCTD (C3, L28-36). Hence one skilled in the art would use space time block coded transmit antenna diversity as a design choice.

It would have been obvious to one skilled in the art at the time of the invention to modify Harrison, such that space time block coded transmit antenna diversity is used, to provide designs whereby the type of diversity is flexible as a design choice.

As per **claim 13**, Harrison teaches claim 1 and a receiver (title).

As per **claim 14**, Harrison teaches claim 13 wherein the receiver comprises one antenna for receiving the signals transmitted from a plurality of antennas (figure 1 shows receiver #56 receiving signals from multiple antennas #116 and #118).

As per **claim 15**, Harrison teaches claim 13 **but is silent on** wherein the receiver comprises a plurality of antennas, wherein each of the plurality of antennas is for receiving the signals transmitted from a plurality of antennas.

The use of multiple receiver antennas is a design choice (since one antenna will work) but the examiner puts forth Naguib (figure 1, #21/22) as disclosing the use of multiple receiver antennas.

It would have been obvious to one skilled in the art at the time of the invention to modify Harrison, such that the receiver is comprised of a plurality of antennas, to provide antenna diversity.

As per **claim 16**, Harrison teaches/discloses claim 13 and open/closed loop diversity (C1, L58-67) **but is silent on** wherein the receiver comprises decoder circuitry for decoding open/closed loop diversity with respect to the plurality of symbols.

Since Harrison disclosues that open/loop diversity would create complexity in the receiver (C1, L66-67), one skilled in the art would provide decoder circuitry for both types of diversity.

It would have been obvious to one skilled in the art at the time of the invention to modify Harrison, such that the receiver comprises decoder circuitry for decoding open/closed loop diversity with respect to the plurality of symbols, to provide for both open/closed loop diversity.

As per **claim 17**, Harrison teaches claim 16 wherein the receiver comprises:

A despreader coupled to the decoder (figure 1, #124/#126)

A channel estimator coupled to the output of the despreader for determining channel impulse responses based on the despread symbol stream (figure 1, #136/#138 and C3, L59-67, specifically L62)

Decoder circuitry for decoding open/closed loop diversity with respect to the despread symbol stream and in response to the estimated channel impulse responses (figure 1, #148).

As per **claim 18**, Harrison teaches claim 17 wherein the receiver further comprises a channel decoder coupled to an output of the demultiplexer (figure 1, #146) [eg. deinterleaver] for improving data rate from the decoder.

As per **claim 19**, Harrison teaches claim 18 wherein the receiver further comprises a channel decoder (figure 1, #148) coupled to an output of the deinterleaver for improving data error rate from the deinterleaver.

As per **claims 20 and 21**, Harrison teaches claim 1 and the use of spreading codes which are known in the art as inherent to CDMA and WCDMA (C3, L13-17 and C3, L46-58).

As per **claim 22**, Harrison teaches claim 1 **but is silent on** wherein the signals comprise TDMA communications.

Lundby discloses that CDMA is a multiple access wireless system as is TDMA, FDMA (C1, L14-19) which relates similarity and hence the ability to generically replace one with the other (in regard to high level operations).

It would have been obvious to one skilled in the art at the time of the invention to modify Harrison, such that TDMA communications is supported, to provide support to any/all types of multiple access wireless systems.

As per **claim 23**, Harrison teaches claim 1 wherein the transmitter is the base station and the receiver is the mobile receiver (C2, L58-60 and figure 1, #52 is BTS and #56 is mobile unit).

As per **claim 27**, Harrison teaches claim 1, a transmitter (figure 1, #52) and

An interleaver couples to output of the channel encoder (figure 1, #62)

A symbol mapper (eg. spreader) coupled to an output of the interleaver (figure 1, #60 and #76)

but is silent on further comprises:

A channel encoder (ie. block, convolutional, turbo, combo, etc.) for receiving a plurality of bits.

While encoder/decoders are known in the art, Naguib discloses block codes (figure 1, #13 and #33), transitter diversity (C1, L10-11 and C1, L53-67) and multiple transmit/receive antennas (C3, L10-25) in a wireless system.

It would have been obvious to one skilled in the art at the time of the invention to modify Harrison, such that encoder/decoders are used, to improve raw bit error rate.

As per **claim 30**, Harrison teaches claim 28 and a plurality of antennas for transmitting **but is silent on** a plurality of antennas for receiving.

Naguib discloses block codes (figure 1, #13 and #33), transitter diversity (C1, L10-11 and C1, L53-67) and multiple transmit/receive antennas (figure 1, #11/12, #31/32 and #21/22) in a wireless system.

It would have been obvious to one skilled in the art at the time of the invention to modify Harrison, such that there are a plurality of antennas for receiving, to provide antenna diversity.

Claims 2-7 and 35 rejected under 35 U.S.C. 103(a) as being unpatentable over Harrison, Naguib and Lundby and further in view of Dartois U.S. Patent 6,181,955, Sabat Jr. et al. U.S. Patent 6,122,529 and Berger et al. U.S. Patent 5,259,003 (hereafter referred to as Dartois, Sabat and Berger).

As per **claims 2 and 35**, Harrison teaches claim 1/34 and multiple antennas (C1, L23-25) **but is silent on** a plurality of sets of antennas and wherein for each of the sets of antennas the encoder circuitry is for applying open loop diversity to selected ones of the plurality of symbols such that signals transmitted by any one antenna in the set of

antennas represent open loop diversity with respect to the signals transmitted by any other antenna in the set of antennas.

The use of "sets of antennas" is known in the art as per **Dartois** (C1, L65-67 and C4, 9-12), **Sabat** (figure 2 and C6, L4-5) and **Berger** (figure 1, #36 with #58a/58b and C4, L53-59). Hence one skilled in the art could replace Harrison's multiple antennas with multiple sets of antennas.

The examiner notes that a RAKE receiver can make a comparison among several antennas and reads on the applicant "...wherein for each of the sets of antennas the encoder circuitry is for applying open loop diversity to selected ones of the plurality of symbols such that signals transmitted by any one antenna in the set of antennas represent open loop diversity with respect to the signals transmitted by any other antenna in the set of antennas".

It would have been obvious to one skilled in the art at the time of the invention to modify Harrison, such that there are a plurality of sets of antennas and encoder circuitry, to provide diversity across the plurality of sets of antennas (eg. instead of performing diversity across several individual antennas, the invention performs diversity across several sets of antennas).

As per **claims 3 and 36**, Harrison teaches claim 2/35 and applying a weight to the symbols such that signals transmitted in response to the weight represent a closed loop diversity with respect to signals transmitted by any other antenna in any other of the sets of antennas (C3, L56-67 to C4, L1-3).

As per **claim 4**, Harrison teaches claim 3 **but is silent on** wherein the plurality of sets of antennas is two sets and wherein each of the sets consists of two antennas.

The use of "sets of antennas" is known in the art as per Dartois (C1, L65-67 and C4, 9-12), Sabat (figure 2 and C6, L4-5) and Berger (figure 1, #36 with #58a/58b and C4, L53-59). Hence one skilled in the art could replace Harrison's multiple antennas with multiple sets of antennas wherein the plurality of sets is two and each set consists of two antennas.

It would have been obvious to one skilled in the art at the time of the invention to modify Harrison, such that antenna sets is two and each set has two antennas, to provide designs whereby the number of "sets" and "antennas" is flexible to allow varying degrees of antenna diversity as a design choice.

As per **claim 5**, Harrison teaches claim 3 **but is silent on** wherein the plurality of sets of antennas is three sets and wherein each of the sets consists of two antennas.

The use of "sets of antennas" is known in the art as per Dartois (C1, L65-67 and C4, 9-12), Sabat (figure 2 and C6, L4-5) and Berger (figure 1, #36 with #58a/58b and C4, L53-59). Hence one skilled in the art could replace Harrison's multiple antennas with multiple sets of antennas wherein the plurality of sets is three and each set consists of two antennas (as a design choice).

It would have been obvious to one skilled in the art at the time of the invention to modify Harrison, such that antenna sets is three and each set has two antennas, to provide designs whereby the number of "sets" and "antennas" is flexible to allow varying degrees of antenna diversity as a design choice.

As per **claim 6**, Harrison teaches claim 3 **but is silent on** wherein the plurality of sets of antennas is two sets and wherein each of the sets consists of four antennas.

The use of "sets of antennas" is known in the art as per Dartois (C1, L65-67 and C4, 9-12), Sabat (figure 2 and C6, L4-5) and Berger (figure 1, #36 with #58a/58b and C4, L53-59). Hence one skilled in the art could replace Harrison's multiple antennas with multiple sets of antennas wherein the plurality of sets is two and each set consists of four antennas (as a design choice).

It would have been obvious to one skilled in the art at the time of the invention to modify Harrison, such that antenna sets is two and each set has four antennas, to provide designs whereby the number of "sets" and "antennas" is flexible to allow varying degrees of antenna diversity as a design choice.

As per **claim 7**, Harrison teaches claim 3 **but is silent on** wherein the plurality of sets of antennas is four sets and wherein each of the sets consists of two antennas.

The use of "sets of antennas" is known in the art as per Dartois (C1, L65-67 and C4, 9-12), Sabat (figure 2 and C6, L4-5) and Berger (figure 1, #36 with #58a/58b and C4, L53-59). Hence one skilled in the art could replace Harrison's multiple antennas with multiple sets of antennas wherein the plurality of sets is four and each set consists of two antennas (as a design choice).

It would have been obvious to one skilled in the art at the time of the invention to modify Harrison, such that antenna sets is four and each set has two antennas, to provide designs whereby the number of "sets" and "antennas" is flexible to allow varying degrees of antenna diversity as a design choice.

Claims 28-29, 31-33 rejected under 35 U.S.C. 103(a) as being unpatentable over Harrison.

As per **claim 28**, Harrison teaches a wireless communication transmitter/receiver (figure 1) comprising;

Transmitter circuitry (C2, L58-60);

A plurality of TRANSMIT antennas (figure 1, #116 and #118); and

Wherein the transmitter circuitry is for applying open loop diversity and closed loop diversity to the plurality of symbols to form the symbols (C1, L58-67).

A despreader (figure 1, #124 and #126)

A decoder coupler to the despreader (figure 1, #148)

The examiner also points out that Lundby teaches the use of multiple types of diversity, including delay transmit, OTD, TSTD, TDTD and MCTD (C3, L28-36).

As per **claim 29**, Harrison teaches claim 28 and one antenna for receiving and a plurality of antennas for transmitting (figure 1 shows multiple transmit antennas #116 and #118 and one receive antenna #120).

As per **claim 31**, Harrison teaches claim 28 further comprising:

A channel estimator coupled to the output of the despreader for determining channel impulse responses based on the despread symbol stream (figure 1, #136/#138 and C3, L59-67, specifically L62)

Decoder circuitry for decoding open/closed loop diversity with respect to the despread symbol stream and in response to the estimated channel impulse responses (figure 1, #148).

As per **claim 32**, Harrison teaches claim 31 and a demux/deinterleaver (figure 1, #146) **but is silent on** the demux being coupled to an output of the decoder for providing inverse interleaving function with respect to the information received from the decoder circuitry.

One skilled in the art would connect the demux to the output of the decoder to reconstruct the data signal and feed it back to the transmitter to provide a feedback loop.

It would have been obvious to one skilled in the art at the time of the invention to modify Harrison, such that the demux is coupled to the output of the decoder, to provide feedback to the transmitter by reconstructing the received signal and sending it back.

As per **claim 33**, Harrison teaches claim 32 wherein the receiver further comprises a channel decoder coupled to an output of the demultiplexer (figure 1, #146) [eg. deinterleaver] for improving data rate from the decoder.

Claims 24-26 rejected under 35 U.S.C. 103(a) as being unpatentable over Harrison, Naguib and Lundby and further in view of Salt U.S. Patent 6,389,085 (hereafter referred to as Salt).

As per **claims 24, 25 and 26**, Harrison teaches claim 1 **but is silent on** wherein the plurality of symbols comprise QPSK, BPSK and QAM symbols.

Salt teaches a receiver combiner for spatial diversity (title) that uses multiple antennas and discloses that any suitable digital differential coding scheme may be readily used in conjunction with the signal processing and apparatus of the present invention and may include, by way of illustration and exemplification such schemes as BPSK, QAM (or QASK as it is often called) and QPSK among others (C10, L34-39).

It would have been obvious to one skilled in the art at the time of the invention to modify Harrison, such that QPSK, BPSK and QAM are supported, to provide designs whereby the type of coding/signaling is flexible as a design choice.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

1. Schmidl et al. U.S. Patent 6,242,642 teaches diversity.
2. Meszko U.S. Patent 6,327,299 teaches orthogonal transmit diversity.
3. Kotzin et al. U.S. Patent 5,953,659

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen M. D'Agosta whose telephone number is 703-306-5426. The examiner can normally be reached on M-F, 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Daniel Hunter can be reached on 703-308-6732. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and 703-872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist on telephone number 703-306-0377.

SMD
August 30, 2002

THANH CONG LE
PRIMARY EXAMINER